DOCUMENT-IDENTIFIER: US 20020177243 A1

TITLE: Semiconductor device having a ferroelectric

capacitor and a fabrication

process thereof

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[0024] Meanwhile, it is known that the <u>PZT</u> or PLZT film constituting the ferroelectric capacitor insulation film 16 of FIG. 1 shows a <u>columnar</u> microstructure and that the value of the spontaneous polarization 2Pr is maximized when the crystal <u>grains</u> therein are oriented in the &lt;111&gt; direction.

DOCUMENT-IDENTIFIER: US 20020158278 A1

TITLE: Ferroelectric semiconductor memory device and a fabrication process

thereof

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[0081] As represented in FIG. 4, the projections and depressions that can be seen on the surface of the <u>PZT</u> film 34 in the SEM images of FIGS. 3A-3D correspond to the <u>columnar</u> crystal <u>grains of PZT</u> grown in the <u>PZT</u> film 34 as a result of the crystallization of the <u>PZT</u> film 34.

DOCUMENT-IDENTIFIER: US 20020158278 A1

TITLE: Ferroelectric semiconductor memory device and a fabrication process

thereof

----- KWIC -----

[0081] As represented in FIG. 4, the projections and depressions that can be seen on the surface of the <u>PZT</u> film 34 in the SEM images of FIGS. 3A-3D correspond to the <u>columnar</u> crystal <u>grains of PZT</u> grown in the <u>PZT</u> film 34 as a result of the crystallization of the <u>PZT</u> film 34.

DOCUMENT-IDENTIFIER: US 20020030723 A1

TITLE: Piezoelectric thin film component, inkjet type recording head and inkjet printer using this [piezoelectric thin film component], and method of manufacturing piezoelectric thin film component

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[0054] The PZT film is comprised of a polycrystalline substance, and the grain boundaries of the crystal grains exist roughly in a vertical direction with respect to the planes of the top and bottom electrodes 14 and 16, that is, in the film thickness direction of the piezoelectric thin film, as FIG. 14 and FIG. 15 show. In other words, the crystal grains of PZT are in a columnar structure, as described later.

[0100] If PZT is grown using titanium crystals as the nucleus, crystal grains of the PZT grow such that [one grain] is formed on a plurality of adjacent platinum crystals of the bottom electrode. Normally manufacturing is easy with Pt, which has a stable 111 orientation, and if titanium seed crystals are formed on crystal grain boundaries which are less influenced by the orientation of platinum, it is possible to form PZT crystals to be columnar crystals with a (100) and (001) orientation, which are not influenced by the crystal orientation of platinum. Since a crystal grain of the PZT is formed on a plurality of [crystals] of the bottom electrode, an improvement of adhesion with the bottom electrode is expected.